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STATUS AND TRENDS OF DOUGLAS-FIR TUSSOCK MOTH INFESTATIONS IN NORTHERN IDAHO AND NORTHWESTERN MONTANA

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INTRODUCTION

Information about Douglas-fir tussock moth, Hemerocampa pseudotsugata McD., epidemics indicates they are cyclic in the western American Continent. Since the first recorded infestation near Chase, British Columbia, Canada, in 1918, they have appeared in the following sequence:1/

Locations of outbreaks	Damage first noticed	Outbreak subsided	Years between outbreaks
Canada, Oregon, Nevada, Idaho, Washington	1927	1930	--
Idaho, Oregon	1935	1939	5
Idaho, Oregon, Washington	1945	1947	6
California, Idaho, Washington	1951	1957	4
Idaho, California, Montana, Oregon, Washington	1961	Still active	4

The above data seems to indicate that outbreaks occur at 4- to 6-year intervals. The potential destructiveness of this moth has been established. During 1929-30, it killed about 300 million board feet of fir timber on the Colville National Forest, Washington, and was capable of infesting 500,000 acres in northeastern Oregon, eastern Washington, and northern Idaho between 1946 and 1947. Tussock moth

1/ Evenden, J. C., An outbreak of the Douglas-fir tussock moth in Latah and Clearwater Counties, Idaho. Unpub. rpt. filed at Div. For. Insect Res., For. Serv., USDA, Missoula, Montana, 1946.

larvae are so destructive because they can kill fir trees in a single year by eating both old and current foliage. It is more common for them to kill just the top one-third or one-half of a tree. This, of course, lowers commercial value of the tree.

In 1961 the start of another outbreak began when Douglas-fir, grand fir, and ornamental spruce trees were defoliated near private homes and in farm woodlots within Moscow, Clark Fork, and Bonners Ferry, Idaho (fig. 1). In 1962 infestations appeared near eight other towns in northern Idaho. Defoliation became apparent in larger forested areas by 1963. About 1,400 acres of Douglas-fir southwest of Kalispell, Montana, were heavily damaged and evidence of feeding was detected within several stands of grand fir in Idaho. Severe epidemics developed during 1964. Defoliation, visible from the air, covered about 70,000 acres in Benewah and Latah Counties, Idaho. Ground surveys showed that the limits of this epidemic included 191,000 acres which extended from Moscow north to Coeur d'Alene Lake. Grand fir and Douglas-fir trees on several thousand acres were 70 to 90 percent defoliated. The number of acres defoliated near Kalispell, Montana, increased to 4,800 and about 250 acres were infested south of Polson, Montana. Although the amount of damage increased in many areas during 1964, populations decreased in some places due to natural enemies, especially polyhedrosis virus.

Figure 1: Douglas-fir trees defoliated by tussock moth larvae.

Biological evaluations of the major tussock moth outbreaks in the Northern Region were made during October 1964 to determine their status and trend in 1965.

SUMMARY OF LIFE HISTORY

In September, wingless female tussock moths lay eggs in a mass on top of their cocoons. A mass may contain as many as 250 eggs which are bound together by a frothy, gelatinous substance, and hairs from the female's body (fig. 2). The eggs remain dormant over winter. They hatch by June and larvae (fig. 3) feed until August. Larvae construct hairy cocoons (fig. 4), pupate within them, and emerge as adults (fig. 5) during late summer.

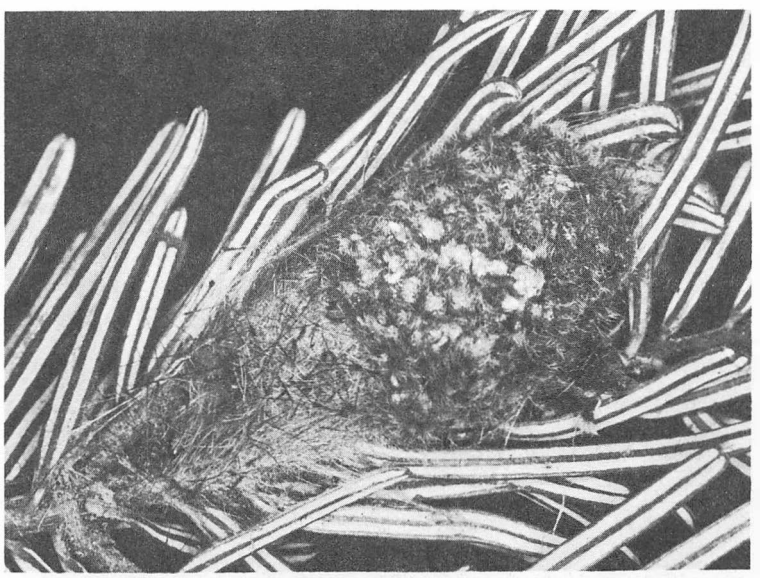


Figure 2: Egg mass on cocoon attached to grand fir twig.

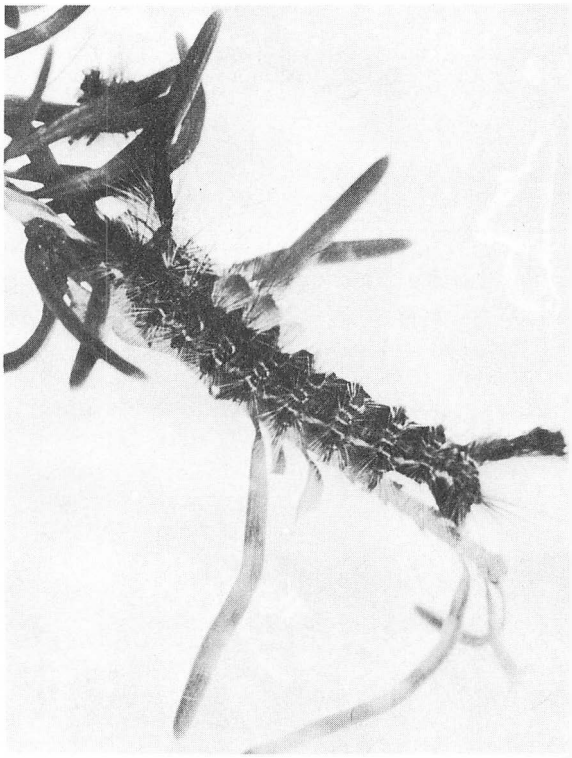


Figure 3: A 4- to 5-week old larva on fir needles. Note tussocks of hair on back.

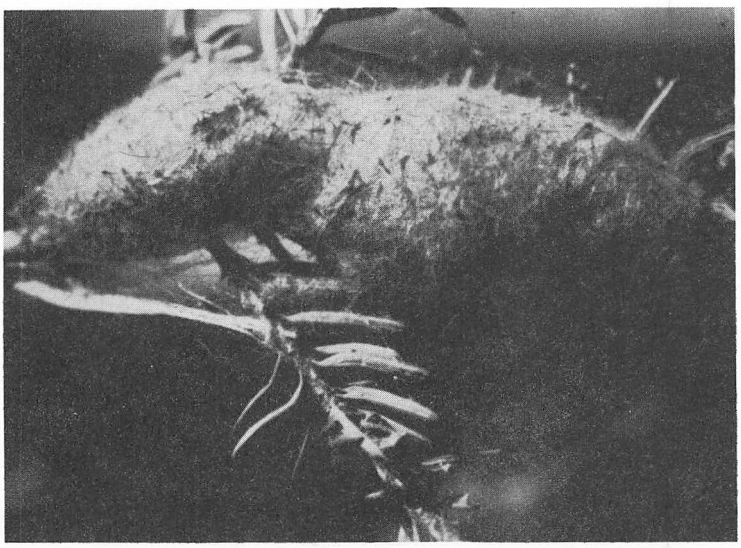


Figure 4: Two tussock moth cocoons on grand fir twig.

Figure 5: Adult male moth on cocoon.

METHODS

Cocoon samples were obtained by hand picking from lower limbs of host trees or removing them from upper limbs that had been cut off with pole pruners. These samples were examined in the laboratory for egg masses, successful adult emergence, and were opened to determine pupal mortality.

The number of 1964 egg masses compared with the number from previous years is used as a guide for predicting infestation trends--as an epidemic increases, new egg masses greatly outnumber old ones.

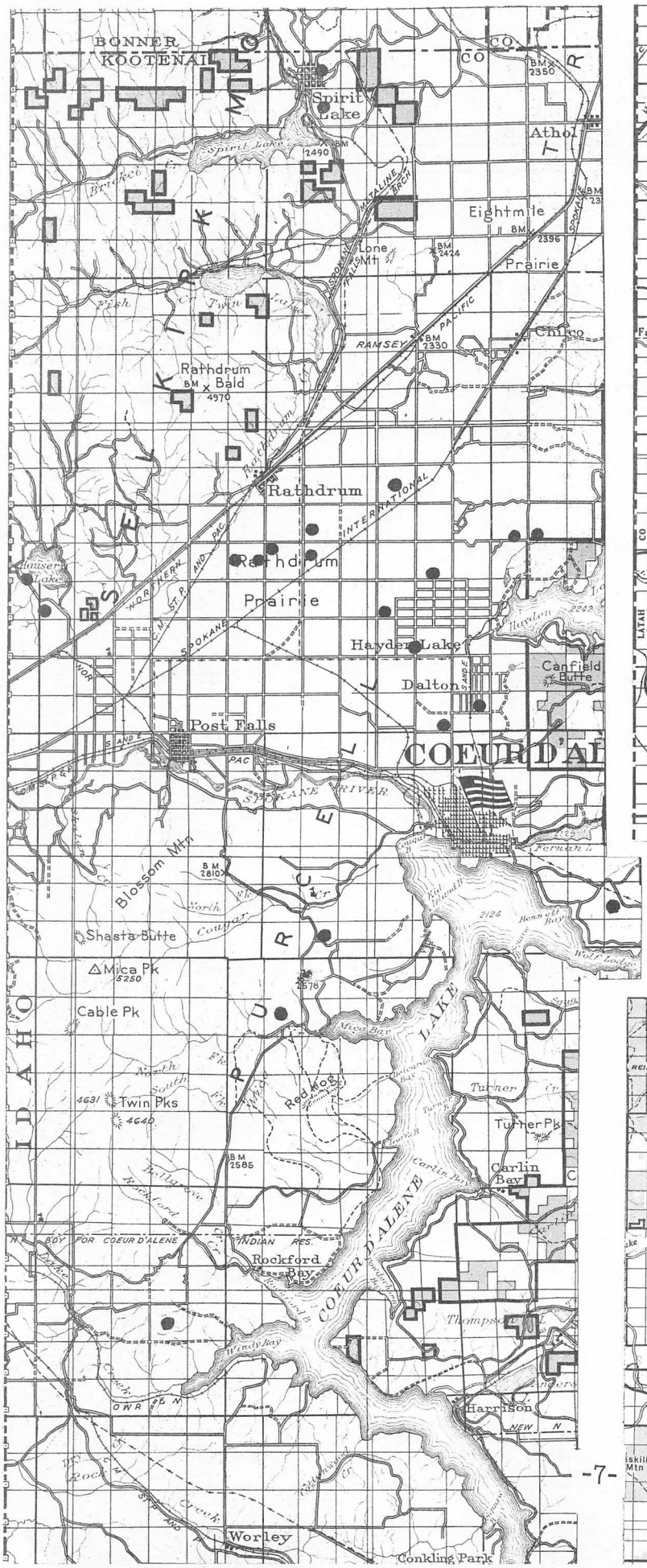
RESULTS

Table 1 shows data obtained from the examination of cocoon samples collected at major outbreak areas.

Probable infestation trends for 1965 in outbreak areas (fig. 6), based on percentages of current egg masses and pupal mortality taken from table 1, are listed in table 2.

Table 1.--Abundance of current egg masses and percentages of pupal mortality during October 1964 within Douglas-fir tussock moth infestations in northern Idaho and northwestern Montana

Cocoon collecting areas	Total No. of cocoons examined	Cocoons bearing egg masses		Pupae in cocoons				Total percent of pupae killed
					Killed by			
		1964	Older	Successfully emerged	Diptera	Hymenoptera	Undetermined agents	
Bigfork, Montana	212	2	12	73	6	3	130	
Percent		14	86	34	3	2	61	66
Polson, Montana	139	25	17	72	3	4	60	
Percent		59	41	52	2	3	43	48
Kalispell, Montana	415	1	95	209	4	1	201	
Percent		1	99	51	1	0	48	49
Rathdrum, Idaho	107	0	10	46	13	1	47	
Percent		0	100	43	12	1	44	57
Hayden Lake, Idaho	349	5	73	134	36	16	163	
Percent		6	94	38	10	5	47	62
Mica, Idaho (Southwest of Coeur d'Alene)	164	7	4	70	8	2	84	
Percent		64	36	43	5	1	51	57
Charles Butte, Idaho (T. 44 N., R. 3 W.)	211	86	1	153	6	8	44	
Percent		99	1	72	3	4	21	28
Mineral Mountain, Idaho (T. 43 N., R. 4 W.)	406	100	18	309	7	1	89	
Percent		85	15	76	2	0	22	24
Northwest of Princeton, Idaho	408	186	2	335	3	12	58	
Percent		99	1	82	1	3	14	18
Moscow Mountain, Idaho (T. 40 N., R. 4 W.)	164	30	2	75	4	14	71	
Percent		94	6	46	2	9	43	54
South of Harvard, Idaho (Tps. 40 and 41 N., R. 3 W.)	994	275	23	699	16	23	256	
Percent		92	8	70	2	2	26	30



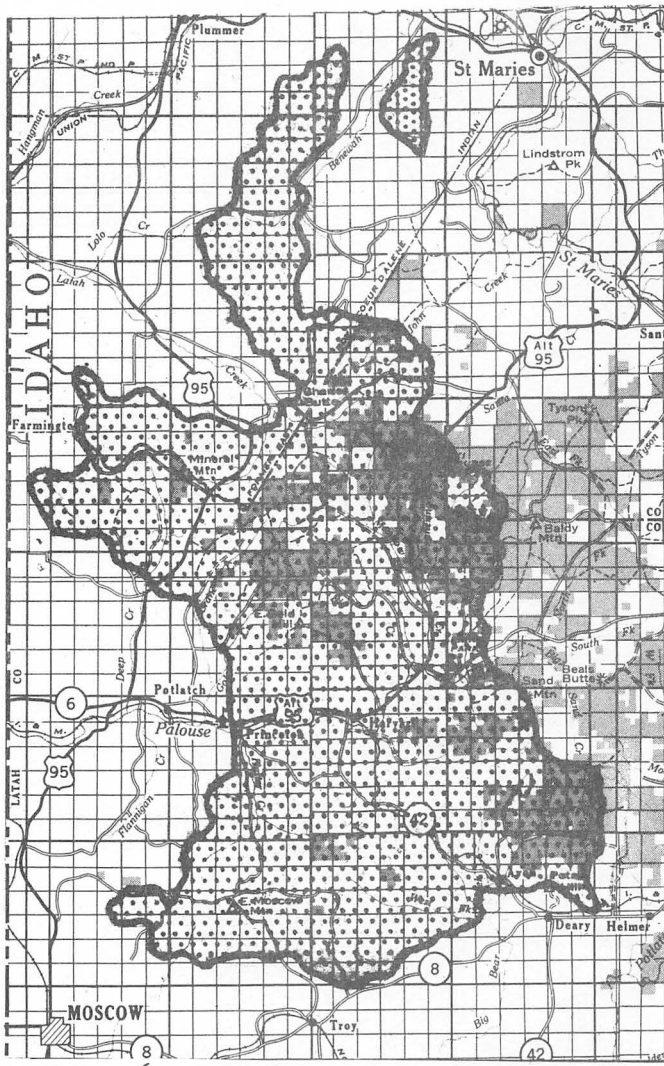


FIGURE 6.--INFESTATIONS OF DOUGLAS-FIR TUSSOCK MOTH IN IDAHO AND MONTANA 1964

● — ISOLATED INFESTATIONS (2-50 TREES)

— INFESTED AREAS

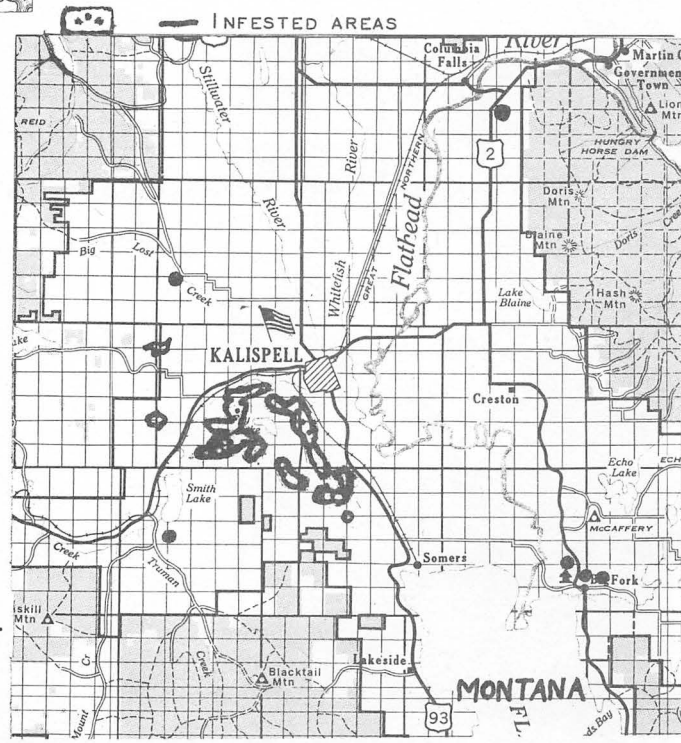


Table 2.--Probable trend of Douglas-fir tussock moth infestations in northern Idaho and northwestern Montana in 1965

Localities of outbreaks	Percent of total egg masses that were laid in 1964	Percent of pupae killed	Probable infestation trend for 1965
Bigfork, Montana	14	66	Decrease
Polson, Montana	59	48	Static
Kalispell, Montana	1	49	Decrease
Rathdrum, Idaho	0	57	Decrease
Hayden Lake, Idaho	6	62	Decrease
Mica, Idaho (southwest of Coeur d'Alene)	64	57	Slight increase
Benewah and Latah Counties, Idaho			
Charles Butte (T. 44 N., R. 3 W.)	99	28	Increase
Mineral Mountain (T. 43 N., R. 4 W.)	85	24	Increase
Northwest of Princeton	99	18	Increase
Moscow Mountain (T. 40 N., R. 4 W.)	94	54	Increase
South of Harvard (Tps. 40 and 41 N., R. 3 W.)	92	30	Increase

Bigfork, Montana.--There was evidence that Douglas-fir tussock moths were active here during 1962. Damage was not very noticeable in 1963, but three heavily defoliated areas were found during 1964. A polyhedrosis virus drastically reduced the larval population by September. Four gallons of diseased larvae were collected for the purpose of extracting the virus.

Polson, Montana.--In 1963 tussock moth feeding was not evident in the 250 acres that were defoliated during 1964. Remaining foliage on partially defoliated trees will probably be consumed and damage will spread somewhat within the area in 1965.

Kalispell, Montana.--As previously mentioned, this infestation increased from 1,400 acres in 1963 to 4,800 during 1964. A polyhedrosis virus, which became virulent last year, almost eliminated the population by August 1964. Two gallons of the diseased larvae were collected. Very few 1964 egg masses were present in defoliated areas. This indicates the infestation will decrease in 1965.

Rathdrum, Idaho.--Several small infestations, consisting of 3-10 trees, occurred near Rathdrum during 1964. No 1964 egg masses could be found in October. Not much defoliation is expected in 1965.

Hayden Lake area, Idaho.--Isolated infestations around private homes and farms have been present since 1961. Most of the owners sprayed their trees, and in 1963 only one infestation was still active. However, in 1964 more than six new infestations were detected. Current egg masses were not abundant; therefore, defoliation should be slight in 1965.

Mica, Idaho.--Two small infestations began near Mica in 1964. There were enough current egg masses to cause a slight increase in these infestations during 1965.

Benewah and Latah Counties, Idaho.--During 1963 only a few egg masses were found near Palouse, east of Moscow, and on Mineral Mountain. Now, the tussock moth infests 191,000 acres within these two counties. This illustrates how explosive Douglas-fir tussock moth populations can be. Cocoon samples were collected during October 1964 from 25 infested plots within these counties. Current egg masses were abundant. In 1965 defoliation will continue within areas that were damaged in 1963 and will increase in newly infested stands.

DISCUSSION

Besides the major outbreak areas mentioned above, some tussock moth feeding was observed in Troy, Tally Lake, Bonita, and Missoula, Montana. Continued defoliation also occurred in Bonners Ferry and Copeland, Idaho. Since 1961 tussock moth populations have gradually died off in the following towns due to spraying or natural causes:

1. Moscow, Idaho
2. Orofino, Idaho
3. St. Maries, Idaho
4. Algoma Lake, Idaho
5. Albeni Falls, Idaho
6. Coeur d'Alene, Idaho
7. Moyie, Idaho
8. Clark Fork, Idaho

The 6 gallons of virus-killed larvae collected near Kalispell and Bigfork, Montana are being processed at the Forest Insect and Disease Laboratory in Corvallis, Oregon. There will be enough virus extracted from them to spray 4,000 acres at the rate of 1 billion polyhedra per acre. Each polyhedron is a bundle of virus rods. To supplement this, an attempt will be made to rear Douglas-fir tussock moth larvae, infect them with the virus, and then extract the polyhedra from the cadavers. If enough virus solution is available, 6,000 to 10,000 acres will be sprayed from the air when the larvae begin to feed in 1965. This will be a cooperative venture with the Pacific Northwest Forest and Range Experiment Station to determine the effects of various dosage rates and to test the material when used on an operational scale. Some defoliation is expected following spraying because it usually takes several weeks for the virus to kill tussock moth larvae.

Where tree mortality seems imminent in Benewah and Latah Counties, Idaho, aerial sprays of insecticides might be used to control tussock moth larvae.